

## CLAIMS

What is claimed is:

- 1    1.     A magnetic head comprising:  
2           a read sensor including:  
3                at least one primary pinned layer;  
4                a barrier layer;  
5                a free layer;  
6                an in-stack biasing structure having net magnetic moment  $dM=0$ , which  
7           acts to stabilize said free layer by exchange coupling.
  
- 1    2.     The magnetic head of claim 1, wherein:  
2           said in-stack biasing structure includes paired layers of opposite magnetic  
3           orientation which are separated by a spacer layer, such that the net magnetic moment of  
4           said paired layers is substantially zero.
  
- 1    3.     The magnetic head of claim 1, wherein:  
2           said  $dM=0$  corresponds to a  $dT$  less than  $5 \times 10^{-10}$  meters, where magnetic  
3           thickness  $T = M \times t$ , and  $M$  equals magnetization,  $t$  equals thickness of material, and  $dT$   
4           is the differential in the layer thicknesses.
  
- 1    4.     The magnetic head of claim 1, wherein:  
2           said in-stack biasing structure includes a self-pinned layer pair.

1     5.     The magnetic head of claim 1, wherein:  
2             said at least one primary pinned layer includes a pair of primary pinned layers,  
3     separated by a spacer layer.

1     6.     The magnetic head of claim 5, further comprising:  
2             at least one layer of AFM material which acts to pin said pair of primary pinned  
3     layers.

1     7.     The magnetic head of claim 5, wherein:  
2             said pair of primary pinned layers are self-pinned layers.

1     8.     The magnetic head of claim 1, wherein:  
2             said read sensor is of Current Perpendicular to the Plane (CPP) configuration.

1     9.     A disk drive comprising:  
2             at least one hard disk;  
3             at least one magnetic head adapted to fly over said hard disk for writing data on  
4     said hard disk, and having an air bearing surface, said magnetic head including:  
5             a read sensor including:  
6                 at least one primary pinned layer;  
7                 a barrier layer;  
8                 a free layer;

9                                    an in-stack biasing structure having  $dM=0$ , which acts to stabilize  
10                                    said free layer by exchange coupling.

1    10.    The disk drive of claim 9, wherein:  
2                                    said in-stack biasing structure includes paired layers of opposite magnetic  
3    orientation which are separated by a spacer layer, such that the net magnetic moment of  
4    said paired layers is substantially zero.

1    11.    The disk drive of claim 9, wherein:  
2                                    said  $dM=0$  corresponds to a  $dT$  less than  $5 \times 10^{-10}$  meters, where magnetic  
3    thickness  $T = M \times t$ , and  $M$  equals magnetization,  $t$  equals thickness of material, and  $dT$   
4    is the differential in the layer thicknesses.

1    12.    The disk drive of claim 9, wherein:  
2                                    said in-stack biasing structure includes a self-pinned layer pair.

1    13.    The disk drive of claim 9, wherein:  
2                                    said at least one primary pinned layer includes a pair of primary pinned layers,  
3    separated by a spacer layer.

1    14.    The disk drive of claim 13, further comprising:  
2                                    at least one layer of AFM material which acts to pin said pair of primary pinned  
3    layers.

1 15. The disk drive of claim 13, wherein:

2 said pair of primary pinned layers are self-pinned layers.

1 16. The disk drive of claim 9, wherein:

2 said read sensor is of Current Perpendicular to the Plane (CPP) configuration.

1 17. A method of fabrication of a read head sensor, comprising:

2 A) fabricating at least one primary pinned layer;

3 B) fabricating a free layer above said at least one primary pinned layer; and

4 C) fabricating an in-stack biasing structure having  $dM=0$ , which acts to bias said  
5 free layer by exchange coupling.

1 18. The method of fabrication of claim 17, wherein:

2 said in-stack biasing structure includes a self-pinned layer pair.

1 19. The method of fabrication of claim 17, wherein:

2 said at least one primary pinned layer includes a pair of primary pinned layers,  
3 separated by a spacer layer.

1 20. The method of fabrication of claim 17, wherein A further comprises:

2 fabricating at least one layer of AFM which acts to pin said pair of primary  
3 pinned layers.

- 1    21.    The method of fabrication of claim 17, wherein:
- 2            said pair of primary pinned layers are self-pinned layers.